HHS Public Access

Author manuscript

Sex Transm Infect. Author manuscript; available in PMC 2016 June 01.

Published in final edited form as:

Sex Transm Infect. 2015 June ; 91(4): 260–265. doi:10.1136/sextrans-2014-051720.

Discordance of HIV and HSV-2 Biomarkers and Self-reported Sexual Behavior among Orphan Adolescents in Western Kenya

Hyunsan Cho,
The Pacific Institute for Research and Evaluation, Chapel Hill, NC

Winnie Luseno,
The Pacific Institute for Research & Evaluation, Chapel Hill, NC

Carolyn Halpern,
The University of North Carolina at Chapel Hill, Dept. of Maternal and Child Health, Chapel Hill, NC

Lei Zhang,
The Pacific Institute for Research and Evaluation, Chapel Hill, NC

Isabella Mbai,
Moi University, School of Nursing, Eldoret, Kenya

Benson Milimo, and
Moi University, School of Nursing, Eldoret, Kenya

Denise Hallfors
The Pacific Institute for Research and Evaluation, Chapel Hill, NC

Abstract

Background—This paper examines the discordance between biological data of HIV and HSV-2 infections and self-reported questionnaire responses among orphan adolescents in Western Kenya.

Methods—In 2011 a total of 837 orphan adolescents from 26 primary schools were enrolled in an HIV prevention trial. At baseline, blood samples were drawn for HIV and HSV-2 infection biomarker testing, and participants completed an audio computer-assisted self-interviewing (ACASI) survey.

Corresponding author: Hyunsan Cho, The Pacific Institute for Research and Evaluation, 1516 E. Franklin St., Suite 200, Chapel Hill, NC 27514, Phone – 919-265-2620 Fax – 919-265-2659, cho@pire.org.

Competing Interest: None declared.

AUTHOR CONTRIBUTIONS:
Hyunsan Cho led the overall project concept and the writing of the paper. Winfred Luseno participated in the development of the paper, reviewed and summarized relevant literature, and provided critical reviews of each draft. Carolyn Halpern guided the development of the paper, and provided critical reviews and revisions on each draft. Lei Zhang conducted the data analyses and drafted the Methods section. Isabella Mbai and Benson Milimo oversaw data collection and human subjects protection in Kenya and reviewed and provided comments on manuscript drafts. Denise Hallfors participated in the development of the paper, reviewed and summarized relevant literature, developed key points for the Discussion section, and critically reviewed multiple drafts.

Results—Comparing biological data with self-reported responses indicated that 70% of HIV positive (7 out of 10) and 64% of HSV-2 positive (18 out of 28 positive) participants reported never having had sex. Among ever-married adolescents 65% (57 out of 88) reported never having had sex. Overall, 10% of study participants appeared to have inconsistently reported their sexual behavior. Logistic regression analyses indicated that lower educational level and exam scores were significant predictors of inconsistent reporting.

Conclusions—Our study demonstrates the discordance between infections measured by biomarkers and self-reports of having had sex among orphan adolescents in Kenya. In order to detect program effects accurately in prevention research, it is necessary to collect both baseline and endline biological data. Furthermore, it is recommended to triangulate multiple data sources about adolescent participants' self-reported information about marriage and pregnancies from school records and parent/guardians to verify the information. Researchers should recognize potential threats to validity in data and design surveys to consider cognitive factors and/or cultural context to obtain more accurate and reliable information from adolescents regarding HIV/STI risk behaviors.

Keywords

HIV; HSV; Sexual behaviour; Adolescent; Africa

INTRODUCTION

Globally, over two-thirds of persons aged 15–49 years who are infected with HIV reside in sub-Saharan Africa (SSA).[1] Youth aged 15–24 years account for an estimated 40% of new infections among adults, with 79% of new infections occurring among youth in SSA.[2] The HIV/AIDS pandemic has resulted in millions of orphans in that region. Prevention remains critically important for youth, especially orphan adolescents who are exceptionally vulnerable to HIV risk behaviors compared to non-orphan youth.[3]

Most HIV prevention research has relied on self-reports of sexual behaviors [4] despite the fact that they are subject to bias in regard to recall, poor comprehension of questionnaire items,[5] or social desirability and/or cultural norms regarding socially acceptable behavior. [6] Thus, there has been an increasing call for biological markers as objective outcomes in evaluating the effectiveness of interventions to reduce the incidence of HIV and other sexually transmitted infections (STIs).[7, 8]

Herpes simplex virus type 2 (HSV-2) is one of the most prevalent STIs worldwide and is associated with HIV infection.[9] Researchers have used HSV-2 as a proxy indicator for sexual behavior in prevention research.[8, 10] Although biomarker data are believed to be more valid than self-reported data, one cannot assume that an infected adolescent acquired HIV through sexual transmission, as mother-to-child transmission (MTCT) accounts for a significant proportion of adolescent HIV infections in SSA.[11] Furthermore, absence of HSV-2 infection does not necessarily suggest sexual inexperience. [12] Because large sample sizes are required to demonstrate prevention of low prevalence infections, biomarker data collection may not always be practical and cost effective for prevention research.[13]

Problems of consistency in self-reported sexual behavior, particularly for adolescents, are well known.[14, 15] Researchers have estimated the extent of the problem by checking the inconsistency within self-reported survey items and/or across time points using repeated measurements.[16–18] For example, the majority (95%–100%) of 11–14 year old adolescents in Jamaica responded consistently about first sexual intercourse within each given survey round. However, across three waves of surveys, 37% of respondents - 12% of girls and 65% of boys - responded inconsistently about the timing of their sexual debut.[17] In a Kenyan study of adolescents aged 12–19 (49% of whom were sexually active), 20% gave inconsistent reports about lifetime sexual intercourse and timing of first sexual intercourse,[16] and in South Africa, 40% of sexually active adolescents inconsistently reported lifetime sexual experience.[18]

Another approach is to examine inconsistency across different types of data, e.g., comparing biomarker measures with self-reported survey or face-to-face interviews.[10, 14, 19, 20] One study found that only 52% of adults with biomarkers indicating recent semen exposure reported unprotected sex during the previous 2 days among Zimbabwean women.[20] In another study in Zimbabwe, four girls who were pregnant did not report having had sexual intercourse.[10] Other research found that 58% of male and 29% of female Tanzanian adolescents positive for HIV infection, pregnancy or STIs reported ever having sex in both ACASI and face-to-face interviews. [15]

Researchers have focused on whether socio-demographic factors influence inconsistent self-reports of sexual behaviors. Although patterns vary across studies, findings suggest that boys,[5, 16, 17] persons of lower socioeconomic status (SES), and those who live in slums [16, 17] are more likely to report inconsistently. However, patterns related to an association between education and inconsistent reporting are mixed. Beguy et al. found that youth in school are more likely to misreport their sexual experience than youth not in school, and that attaining secondary school education compared to primary school is not a significant predictor of inconsistent reporting in Kenya.[16] Findings on an association between age and inconsistent self-reports have also been conflicting. Older adolescents were more likely to inconsistently report sexual activity but less likely to retract previous claims of sexual activity.[5, 16]

Accurate and comprehensive data are necessary to estimate HIV prevalence and identify risky sexual behaviors among vulnerable adolescents to develop effective prevention strategies. However, relatively little attention has been paid to the link between cognitive factors and reliability of data among orphans in developing countries. The purpose of this study is to examine the consistency of reporting of sexual behaviors within survey items, and to compare them with biomarkers of HIV and HSV-2 infections from an HIV prevention trial. We also examine the association of socio-demographic and cognitive factors with inconsistent reporting among orphan adolescents in Kenya.

MATERIALS AND METHODS

Study Area

This study uses baseline data collected in an ongoing randomized controlled trial (RCT) in Kenya testing whether providing school support will reduce risky sexual behaviors and prevent HIV/HSV-2 infection among orphan adolescents. The trial was conducted in Siaya District in Nyanza Province. Nyanza has the highest HIV prevalence and orphanhood in Kenya.[21] Almost all of the participants are of Luo ethnicity; Luo's have the highest HIV prevalence among Kenyan ethnic groups.[22]

Sample

We selected 26 primary schools with at least 20 orphans per school in 2011. An orphan was defined as an adolescent who had lost one or both parents to death from any cause. We invited all orphans in grades 7 and 8 in 26 primary schools to participate in the study (n=934) and 837 completed both the student survey and biomarker testing (see Figure 1). All participation was voluntary. We obtained written informed permission from either a surviving parent or custodial guardian and written assent from all participants for study participation. The institutional review boards of PIRE (US) and Moi University (Kenya) reviewed and approved all study procedures.

Measures

Biomarkers data included HIV and HSV-2 infection (positive or not). Detailed description of our biomarker data collection procedures are provided elsewhere.[23] We conducted the baseline survey using ACASI on personal digital assistant (PDA) devices. The self-administered questionnaire was originally developed from several validated instruments and has been used in a previous pilot study in Kenya [24] as well as a similar Zimbabwe study. [25] We added several items from the Kenya Demographic and Health Survey.[22] The final survey was translated into the Luo language and back-translated. Participants could read and respond to questions in either Luo or English. *Sexual Debut* was measured by the survey item "Have you ever had sexual intercourse?" *Marriage* was never married vs. either currently/ever married or living with a man/woman as if married. *Pregnancy* was measured by combining the following survey items: "Are you pregnant?"; "Have you ever had a pregnancy that miscarried, was aborted or ended in a stillbirth?"; "Have you ever given birth?"; and, for boys, "Have you ever fathered any children with any women?" (all coded yes or no). The survey also included orphan type (double, maternal, or paternal), age, and an SES count index (alpha= .62, 13 items). For cognitive development, we included grade level and the Kenya Certificate of Primary Education (KCPE) score, coded in four categories: >300, 201–300, < 200, and no score. The KCPE is a national standardized exam with a maximum score of 500, taken in the eighth year of primary school. Results are used by high schools to select capable students. Test scores for the Grade 7 students were collected after they took the exam in Grade 8. Students may be without scores because of repeating a grade, not meeting eligibility criteria for taking the test, or inability to pay the examination fee.

Inconsistency

We compared answers across survey items within the same questionnaire and compared self-reported and biomarker data. We constructed four inconsistent groups: 1) “Married/ Pregnant but No Sex” (i.e., participant reported never having sex but was married/pregnant); 2) “HSV-2 Positive but No Sex” (reported never having sex but was HSV-2 positive); and 3) “HIV Positive but No Sex” (reported never having sex but was HIV positive). The fourth group “Combined Inconsistent Group” contained all study participants belonging to inconsistent groups 1–3.

Analysis

First, we conducted descriptive analyses regarding sample characteristics. Second, we used bivariate analyses to describe demographic characteristics related to HIV/HSV-2 infection and sexual behaviors. Third, we examined inconsistencies within survey items (e.g. married status against sexual debut) and between biological markers of HIV/HSV-2 infection and survey items. We conducted survey logistic regression analyses in SAS (SAS 9.3) to examine factors associated with inconsistent reports, taking into account the design effects that students are nested within schools. The four groupings of inconsistent reporting were used as dependent variables. We included grade level, gender, orphan type, SES, and KCPE score as predictors.

RESULTS

Participant Baseline Characteristics

Table 1 shows the characteristics of study participants. About half of participants were female, and the mean age was 15 years old. Sixty-one percent of participants were in Grade 7. In both Grade 7 and 8, almost half (47%) were 2 or more years older than the expected age for grade (i.e., 13 years in Grade 7 and 14 years in Grade 8). About half were double or maternal orphans rather than paternal. On average, participants reported that their household owned 5 assets and/or amenities (e.g. farm animal, bicycle). The average KCPE score was 260 (range = 101–398). Twenty-eight percent of participants had low scores of less than 200, 48% had scores in the medium range between 201–300, 15% had high scores that were greater than 300, and 9% had missing scores.

HIV/HSV-2 Infection, Risky Sexual Behaviors, and Demographics

Table 2 presents prevalence of HIV/HSV-2 infection and sexual behaviors as well as their bivariate associations with demographic variables. At baseline, 10 males and 18 females were HSV-2 positive (prevalence=3.2%); 5 females and 5 males were HIV positive (prevalence=1.2%). HSV-2 and HIV infections were not significantly associated with any demographic variables. Overall 185 participants (22%) reported ever having sex. Males and adolescents aged 18 years old or older were more likely to have had sex. Double or maternal orphans had a higher proportion reporting sexual experience compared to paternal. A total of 88 (10.5%) students reported being currently or ever married, and 6 (0.7%) girls reported they were currently or ever pregnant. Students in Grade 7 were more likely to be married/ pregnant compared to Grade 8. SES was not associated with any study outcome.

Predictors of Inconsistent Reporting

As shown in Table 3, about 7% of participants were in the category “Married/Pregnant but No Sex,” 2.2% were in the group “HSV-2 Positive but No Sex,” and 0.8% in the “HIV positive but No Sex” group. Seventy percent of HIV positive (7 out of 10) and 64% of HSV-2 positive (18 out of 28 positive) participants reported never having had sex. Among ever-married adolescents 65% (57 out of 88) reported never having had sex. These groups are mutually exclusive except for one case. Of the total sample, 10% were in the “Combined Inconsistent Group.” Grade and KCPE score were significant predictors of “Married/ Pregnant but No Sex.” Participants in Grade 7 had 5.91 higher odds of inconsistent reporting than those in 8^{th} Grade (p=0.00).

Participants with KCPE scores higher than 200 (OR=0.27) and 300 (OR=0.12) were less likely than those with scores less than 200 to be in this group (p=0.01). For the “HSV-2 Positive but No Sex” and “HIV Positive but No Sex” groups, none of the predictors were significant. For the “Combined Inconsistent Group,” we found that participants in Grade 7 had 2.37 higher odds of inconsistent reporting than Grade 8 (p=0.01) and those with KCPE scores above 300 had a lower likelihood of inconsistent reporting (OR=0.24, p=0.03) than those scoring less than 200.

DISCUSSION

We reported the baseline prevalence of sexual experience and HIV/HSV-2 from an ongoing RCT to examine discordance between biological data and self-reported questionnaire responses among orphan adolescents in Kenya. Overall, 10% of the sample exhibited inconsistency either within their responses to survey items or between the survey and biological data. Seventy percent of the HIV-positive participants, 64% of HSV-2 positive, and 65% of married orphans reported never having had sex. Cognitive development measures (grade level and academic performance) were significant predictors of inconsistent reporting. Proportions of inconsistent reporting in our study are comparable to previous studies. Using a random sample of persons aged 13–34 years in Kenya’s Nyanza province, Amornkul et al. found that among females who denied ever having had sexual intercourse, 1.3% were HIV-positive and 1.6% were pregnant, while 0.8% of males who denied ever having had sex were HIV-positive.[26] Another study found that among Tanzanian adolescents testing positive for HIV, 50% of the males and no females reported sexual debut in both the questionnaire and the face-to-face interview.[14]

Although we treat the “HIV Positive but No Sex” as an inconsistent group, it is possible that some orphans were infected perinatally and survived to adolescence. The equal number of females and males infected in our sample in a high HIV prevalence area might reflect perinatal infection because sexually-acquired HIV infection tends to be higher among females than males.[27] Given the high sensitivity and specificity of HIV testing methods used in this study,[23] we can assume that all participants who were negative at baseline but are newly HIV positive at the endpoint will have acquired HIV infection through unprotected sexual contact during the study. Unfortunately, all three previous RCTs testing the effect of school support on HIV risk conducted in SSA collected only endpoint biomarkers and not baseline.[7, 25, 28]

Because the sensitivity and specificity of Kalon is not 100%, [12] some of those in the HSV-2 positive group could have correctly reported not having had sex. We also cannot assume that those who were HSV-2 negative and had reported never having had sex were consistent reporters. However, the bias should be equal regardless of study condition, and the baseline data will help us examine whether baseline HSV-2 positives still test as positive at endpoint, and also whether new infection rates will differ by condition.

Consistent with previous research, our cognitive development measures were significant predictors of inconsistent reporting. Upchurch et al. found that US adolescents with lower vocabulary test scores were more likely than those scoring higher to provide inconsistent or rescinded reports of sexual intercourse.[5] Another study reported that Zimbabwe women with lower education (primary school or less) reported more problems using ACASI, the keyboard, and correcting mistakes than women in higher educational groups.[29] Our participants in grade 8 and those with higher exam scores compared to their counterparts may have been better able to comprehend survey questions and therefore provide accurate answers, and have less trouble using the PDA during the survey. However, Beguy et al. found secondary school attainment among Kenyan adolescents unrelated to consistent reporting of sexual experience over time, and, among inconsistent reporters, better educated adolescents with higher literacy levels were more likely to retract their initial claim of sexual experience and provide valid answers regarding timing of sex.[16] Palen et al. also found that ever failing a grade in school was unrelated to inconsistent reporting of sexual experience among South African adolescents.[18]

We found that 10.5% of participants reported being currently or ever married, and, among them, 65% reported never having had sex. The Kenya Demographic and Health Survey (KDHS) indicates that 12% of women ages 15–19 were either married or living together, compared to 0.4% of same-age men.[22] The marriage rate of our female participants is consistent with the KDHS report while it was much higher among our study's male orphans. It should be noted that Kenya school policy does not prohibit married or pregnant youth from attending school. Further data corroborating self-reported marital status may be helpful to rule out reporting errors [30]. We currently collect data regarding school dropout and the reasons for dropout from school personnel, but they may not be aware of the marital status of a child who is attending school.

We found that 22% of participants with an average age of 15 were sexually active. This is comparable to KDHS findings that 18% of women ages 15–24 and 27% of men ages 15–24 had reported sexual intercourse before age 15 in Nyanza Province.[22] However, Amornkul et al reported 43.9% of females and 50.2% of males aged 13–19 years old having ever had sexual intercourse in the study area.[26] It is possible that students are less willing to disclose their sexual activity in a school survey if schools have health programs endorsing abstinence.[16] It is also possible that our participants did not report sexual debut if they had been forced to have sex [18], had sex other than penile-vaginal sexual intercourse, or conceptualized sexual intercourse differently. However, we followed our Kenya research staff's recommendation to not attempt to further define "sexual intercourse" or ask about other sexual activity (e.g., oral sex) because these would be inappropriate questions culturally.

Our findings may not be generalizable to Kenyan adolescents as a whole because this study is of Luo orphaned adolescents in a high HIV prevalence area in rural western Kenya. To our knowledge, this is the first orphan study examining inconsistency using both biomarker and survey data. Compared to previous studies which examined several rounds of a survey to assess inconsistency, we examined the discordance between biomarker with survey responses within a single assessment. Causal factors for inconsistent reporting within a single assessment may be different from those identified in several rounds of survey administrations. However, using the baseline data before the intervention started could help to minimize the bias of students reporting desirable or socially acceptable answers for researchers, especially among participants in the intervention arm in an RCT.

In summary, our study demonstrates the discordance between biological data with self-reports of sexual behavior in HIV prevention research. Although biological data are regarded as a more valid measure compared to self-reports of sexual behavior, potential limitations must also be considered. In order to measure true program effects, it is essential to collect both baseline and endpoint biological data in HIV prevention trials because it allows us to more accurately determine program effects and rule out alternative explanations such as MTCT. We conclude that adolescents who are more challenged in academic competency are less consistent reporters, but we found no differences by gender or age. Given these findings, researchers should consider how to develop questionnaires based on the educational and cognitive development of the target population. It is also critical for program evaluators to take into account whether specific groups have a tendency to misreport when evaluating program effects. Finally, triangulating multiple data sources about participants as reported by school records and parent/guardian is important in verifying self-reported information about marriage and pregnancies and is highly recommended.

Acknowledgments

Research reported in this publication was supported by the National Institute of Mental Health of the National Institutes of Health under Award Number R01MH092215 (Hyunsan Cho, PI). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

References

1. The Joint United Nations Programme on HIV/AIDS (UNAIDS). Sub-Saharan Africa. Geneva: UNAIDS; 2012. Regional Fact Sheet 2012.
2. The United Nations Children's Fund (UNICEF). Opportunity in Crisis: Preventing HIV from Early Adolescence to Young Adulthood. New York: UNICEF; 2011.
3. Operario D, Underhill K, Chuong C, et al. HIV Infection and sexual risk behaviour among youth who have experienced orphanhood: systematic review and meta analysis. JIAS. 2011; 14:25.
4. Cowan F, Pettifor A. HIV in adolescents in sub-Saharan Africa. Curr Opin HIV AIDS. 2009; 4:288–293. [PubMed: 19532066]
5. Upchurch DM, Lillard LA, Aneshensel CS, et al. Inconsistencies in reporting the occurrence and timing of first intercourse among adolescents. J Sex Res. 2002; 39:197–206. [PubMed: 12476267]
6. Alexander CS, Somerfield MR, Ensminger ME, et al. Consistency of adolescents' self-reports of sexual behavior in a longitudinal study. J Youth Adolesc. 1993; 22:455–471.

7. Baird SJ, Garfein RS, McIntosh CT, et al. Effect of a cash transfer programme for schooling on prevalence of HIV and herpes simplex type 2 in Malawi: a cluster randomised trial. Lancet. 2012; 379:1320–1329. [PubMed: 22341825]
8. Ross DA, Changalucha J, Obasi AI, et al. Biological and behavioural impact of an adolescent sexual health intervention in Tanzania: a community-randomized trial. AIDS. 2007; 21:1943–1955. [PubMed: 17721102]
9. Abu-Raddad LJ, Magaret AS, Celum C, et al. Genital herpes has played a more important role than any other sexually transmitted infection in driving HIV prevalence in Africa. PLoS One. 2008; 3:e2230. [PubMed: 18493617]
10. Cowan FM, Pascoe SJS, Langhaug LF, et al. The Regai Dzive Shiri Project: a cluster randomised controlled trial to determine the effectiveness of a multi-component community-based HIV prevention intervention for rural youth in Zimbabwe - study design and baseline results. Trop Med Int Health. 2008; 13:1235–1244. [PubMed: 18778329]
11. Ferrand RA, Corbett EL, Wood R, et al. AIDS among older children and adolescents in Southern Africa: projecting the time course and magnitude of the epidemic. AIDS. 2009; 23:2039–2046. [PubMed: 19684508]
12. Bastien S, Mason-Jones AJ, De Koker P, et al. Herpes simplex virus type 2 infection as a biomarker for sexual debut among young people in sub-Saharan Africa: a literature review. Int J STD AIDS. 2012; 23:761–766. [PubMed: 23155093]
13. Fishbein M, Pequegnat W. Evaluating AIDS prevention interventions using behavioral and biological outcome measures. Sex Transm Dis. 2000; 27:101–110. [PubMed: 10676977]
14. Plummer ML, Ross DA, Wight D, et al. “A bit more truthful”: the validity of adolescent sexual behavior data collected in rural northern Tanzania using five methods. Sexual Transm Infect. 2004; 80(Suppl II):49–56.
15. Plummer ML, Wight D, Ross DA, et al. Asking semi-literate adolescents about sexual behaviour: the validity of assisted self-completion questionnaire (ASCQ) data in rural Tanzania. Trop Med Int Health. 2004; 9:737–754. [PubMed: 15189466]
16. Beguy D, Kabiru CW, Nderu EN, et al. Inconsistencies in self-reporting of sexual activity among young people in Nairobi, Kenya. J Adolesc Health. 2009; 45:595–601. [PubMed: 19931832]
17. Eggleston E, Leitch J, Jackson J. Consistency of self-reports of sexual activity among young adolescents in Jamaica. Int Fam Plan Perspect. 2000; 29:79–83.
18. Palen L, Smith E, Caldwell L, et al. Inconsistent reports of sexual intercourse among South African high school students. J Adolesc Health. 2008; 42:221–227. [PubMed: 18295129]
19. Hewett PC, Mensch BS, Erulkar AS. Consistency in the reporting of sexual behaviour by adolescent girls in Kenya: A comparison of interviewing methods. Sexual Transm Infect. 2004; 80(Suppl II):ii43–ii48.
20. Minnis AM, Steiner M, Gallo MF, et al. Biomarker validation of reports of recent sexual activity: results of a randomized controlled study in Zimbabwe. Am J Epidemiol. 2009; 170:918–924. [PubMed: 19741042]
21. National AIDS & STI Control Programme (NASCOP), Republic of Kenya. National Guidelines for HIV Testing and Counseling in Kenya. Nairobi, Kenya: NASCOP; 2008.
22. Kenya National Bureau of Statistics (KNBS) and ICF Macro. Kenya Demographic and Health Survey 2008–2009. Calverton, Maryland: KNBS and ICF Macro; 2010.
23. Luseno WK, Hallfors DD, Cho H, et al. Use of HIV and HSV-2 biomarkers in Sub-Saharan adolescent prevention research: a comparison of two approaches. J Prim Prev. 2014; 35:181–91. [PubMed: 24682861]
24. Cho H, Hallfors DD, Mbai II, et al. Keeping adolescent orphans in school as HIV prevention: evidence from a randomized controlled trial in Kenya. J Adolesc Health. 2011; 48:523–526. [PubMed: 21501814]
25. Hallfors D, Cho H, Rusakaniko S, et al. Supporting adolescent orphan girls to stay in school as HIV risk prevention: evidence from a randomized controlled trial in Zimbabwe. Am J Public Health. 2011; 101:1082–1088. [PubMed: 21493943]

26. Amornkul PN, Vandenhoudt H, Nasokho P, et al. HIV prevalence and associated risk factors among individuals aged 13–34 years in Rural Western Kenya. Plos One. 2009; 4:e6470. [PubMed: 19649242]

27. Glynn JR, Caraël M, Auvert B, et al. Why do young women have a much higher prevalence of HIV than young men? A study in Kisumu, Kenya and Ndola, Zambia. AIDS. 2001; 15(Suppl 4):S51–60. [PubMed: 11686466]

28. Duflo, E.; Dupas, P.; Kremer, M. [accessed 4 June 2014] Education, HIV, and early fertility: experimental evidence from Kenya. Unpublished manuscript. available online 2012. http://www.povertyactionlab.org/publication/education-hiv-and-early-fertility-experimental-evidence-kenya

29. van de Wijgert J, Padian N, Shiboski S, et al. Is audio computer-assisted self-interviewing a feasible method of surveying in Zimbabwe? Int J Epidemiol. 2000; 29:885–890. [PubMed: 11034973]

30. Langhang LF, Sherr L, Cowan FM. How to improve the validity of sexual behavior reporting: systematic review of questionnaire delivery modes in developing countries. Trop Med Int Health. 2010; 15:362–381. [PubMed: 20409291]

Key Messages

- Almost half of orphans in Grade 7 and 8 were 2 or more years older than the appropriate age for grade.
- Seventy percent of HIV positive participants and 64% of HSV-2 positive participants reported they had never had sexual intercourse.
- Lower grade level and poor academic performance were significant predictors of inconsistent reporting among orphan adolescents.

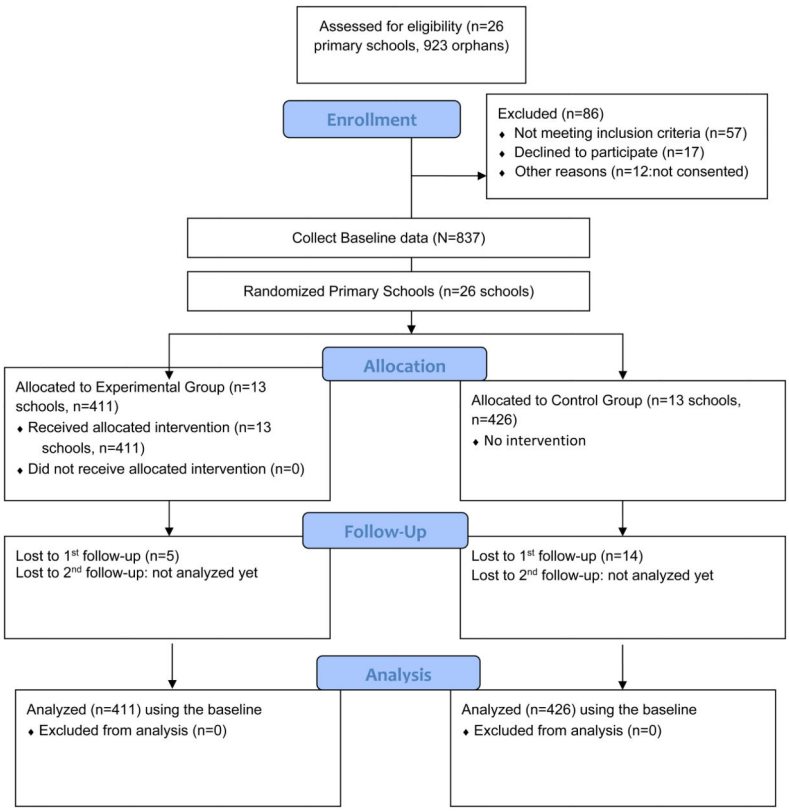

Figure 1.
Study Design Flowchart

Table 1

Demographic Characteristics of Study Sample (Total sample N=837)

Characteristics	Frequency (percent)
Sex	
Female	405 (48.4%)
Male	432 (51.6%)
Age	Mean=14.98 (sd=1.52)
	Range 11 -- 21 years old
Grade Level	
7	507 (60.6%)
8	330 (39.4%)
Orphan Status	
Double or Maternal orphan	392 (47.7%)
Paternal orphan	429 (52.3%)
SES Index (13 items)	
(Cronbach alpha=0.62)	Mean=4.65 (sd=2.02)
	Range 0 -- 12
Kenya Certificate of Primary Education (KCPE)	Mean=260 (sd=50.79)
	Range 101–398
	No score: 75 (9.0%)
	≤ 200: 237 (28.3%)
	201–300: 398 (47.6%)
	>300: 127 (15.2%)

Table 2

Demographic Characteristics of HIV/HSV-2 Infection and Risky Sexual Behaviors

		HSV2 Positive (N=28, 3.2%)	HIV Positive (N=10, 1.2%)	Sexual debut (N=185, 22.2%)	Married/Pregnant Currently or Ever (N=88, 10.5%)
Gender	Male (n=432, 51.7%)	N=10 (2.3%)	N=5 (1.2%)	N=114 (26.4%)	N=39 (9.1%)
	Female (n=405, 48.3%)	N=18 (4.4%)	N=5 (1.2%)	N=71 (17.6%)	N=49 (12.1%)
	p-value	p=0.09	p=0.91	p=0.002**	p=0.15
Age	≤15 (n=566, 67.7%)	N=20 (3.5%)	N=5 (0.9%)	N=103 (18.3%)	N=55 (9.7%)
	16–17 (n=234, 28.0%)	N=6 (2.6%)	N=5 (2.1%)	N=68 (29.1%)	N=28 (12.0%)
	≥18 (n=37, 4.4%)	N=2 (5.4%)	N=0 (0.0%)	N=14 (37.8%)	N=5 (13.5%)
	p-value	p=0.61	p=0.26	P<0.01**	p=0.52
Grade	Grade 7 (n=507, 60.7%)	N=13 (2.6%)	N=7 (1.4%)	N=107 (21.2%)	N=73 (14.4%)
	Grade 8 (n=329, 39.4%)	N=15 (4.5%)	N=3 (0.9%)	N=78 (23.6%)	N=15 (4.6%)
	p-value	p=0.12	p=0.54	p=0.40	p≤.0001**
SES	Low (n=453, 54.2%)	N=15 (3.3%)	N=4 (0.9%)	N=99 (21.9%)	N=46(10.2%)
	High (>5) (n=383, 48.8%)	N=13 (3.4%)	N=6 (1.6%)	N=86 (22.5%)	N=42(11.0%)
	p-value	p=0.94	p=0.36	p=0.82	p=0.70
Orphan Type	Double or Maternal (n=392, 47.7%)	N=13 (3.32%)	N=6 (1.53%)	N=100 (25.6%)	N=45 (11.5%)
	Paternal (n=429, 52.3%)	N=15 (3.5%)	N=4 (0.9%)	N=82 (19.2%)	N=42 (9.8%)
	p-value	p=0.89	p=0.44	p=0.03**	p=0.42
KCPE Score	No Score: (n=75,9.0%)	N=7 (3.0%)	N=5 (2.1%)	N=47 (30.7%)	N=47 (19.8%)
	≤200: (n=237, 28.3%)	N=4 (5.3%)	N=1 (1.3%)	N=23 (19.8%)	N=13 (17.3%)
	201–300: (n=398, 47.6%)	N=14 (3.52%)	N=4 (1.0%)	N=94 (23.7%)	N=26 (6.6%)
	>300: (n=127, 15.2%)	N=3 (2.36%)	N=0 (0.0%)	N=21 (16.5%)	N=2 (1.6%)

	HSV2 Positive (N=28, 3.2%)	HIV Positive (N=10, 1.2%)	Sexual debut (N=185, 22.2%)	Married/Pregnant Currently or Ever (N=88, 10.5%)
p-value	P=0.69	p=0.34	p=0.08	p≤.0001**

Table 3

Predictors of Inconsistent Group: Surveylogistic Regression

	Married/Pregnant But No sex (n=57, 6.8%)	HSV2 Positive But No Sex (n=18, 2.2%)	HIV Positive But No Sex (n=7, 0.8%)	Combined Inconsistent groups (n=80, 9.6%)
	OR (CI)	OR (CI)	OR (CI)	OR (CI)
Age	1.08 (0.9–1.3)	1.08 (0.7–1.6)	0.97 (0.6–1.6)	1.06 (0.9–1.2)
Gender (ref=Male)	1.29 (0.8–2.2)	1.56 (0.6–3.9)	0.84 (0.2–3.1)	1.26 (0.8–1.9)
Grade 7 (ref=grade 8)	5.91 (2.4–14.6)**	0.61 (0.2–1.8)	0.82 (0.2–3.4)	2.37 (1.3–4.2)**
Double/Maternal orphan (ref=paternal orphan)	1.15 (0.6–2.4)	0.72 (0.3–1.7)	2.71(0.6–12.1)	1.06 (0.6–1.7)
SES	1.08 (0.9–1.2)	1.09 (0.9–1.4)	1.04 (0.8–1.4)	1.06 (0.9–1.2)
KCPE (ref=equal lower than 200)				
No score	0.65(0.3–1.2)	1.14 (0.1–9.5)	NA*	0.98 (0.5–1.9)
201–300	0.27 (0.1–0.6)**	0.95 (0.2–4.3)	NA	0.52 (0.2–1.1)
>300	0.12 (0.0–0.6)**	0.68 (0.1–4.4)	NA	0.24 (0.1–0.8)*

* p≤.05,

** p≤.01

* NA: Logistic regression model fails due to consequence of data patterns known as complete or quasi-complete separation.